CLAIMS

1. (Currently Amended) A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile; [[and]]

determining a dimension of the grid based on the reflection profile[[.]] and

providing data relating to determining said dimension of said grid.

2. (Currently Amended) A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile; and

determining a dimension of the grid based on the reflection profile, wherein determining the dimension of the grid further comprises:

comparing the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric;

selecting a reference reflection profile closest to the generated reflection profile; [[and]]

determining the dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile[[.]] and

providing data relating to determining said dimension of said grid.

3. (Original) The method of claim 1, further comprising determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension.

4. (Previously Presented) A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile; and

determining a dimension of the grid based on the reflection profile; and

determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension, wherein determining at least one parameter of the operating recipe of the etch tool comprises determining at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

5. (Original) The method of claim 1, further comprising determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined grid dimension.

6. (Previously Presented) A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile; and

determining a dimension of the grid based on the reflection profile; and

determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined grid dimension, wherein determining at least one parameter of the operating recipe of the photolithography tool comprises determining at least one of an exposure time parameter, an exposure dose parameter, a depth of focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post exposure bake temperature parameter, a cool plate temperature parameter, a developer temperature parameter, and a focus tilt parameter.

7. (Original) The method of claim 1, wherein generating the reflection profile comprises generating the reflection profile based on at least one of intensity and phase of the reflected light.

8. (Original) The method of claim 1, wherein determining the dimension of the grid further comprises:

comparing the generated reflection profile to a target reflection profile; and

determining the dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile.

9. (Original) The method of claim 1, further comprising identifying a fault condition associated with the grid based on the determined grid dimension.

10. (Original) The method of claim 1, wherein determining the dimension of the grid further comprises determining at least one of a width dimension, a depth dimension, and a sidewall angle dimension.

11. (Currently Amended) A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile;

comparing the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric;

selecting a reference reflection profile closest to the generated reflection profile; [[and]]

determining a dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile[[.]] and

providing data relating to determining said dimension of said grid.

12. (Original) The method of claim 11, further comprising determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension.

13. (Previously Presented) A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile;

comparing the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric;

selecting a reference reflection profile closest to the generated reflection profile;

determining a dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile; and

determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension, wherein determining at least one parameter of the operating recipe of the etch tool comprises determining at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

14. (Original) The method of claim 11, further comprising determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined grid dimension.

15. (Previously Presented) A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile;

comparing the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric;

selecting a reference reflection profile closest to the generated reflection profile;

determining a dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile; and

determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined grid dimension, wherein determining at least one parameter of the operating recipe of the photolithography tool comprises determining at least one of an exposure time parameter, an exposure dose parameter, a depth of focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post exposure bake temperature parameter, a cool plate temperature parameter, a developer temperature parameter, and a focus tilt parameter.

16. (Original) The method of claim 11, wherein generating the reflection profile comprises generating the reflection profile based on at least one of intensity and phase of the reflected light.

17. (Original) The method of claim 11, further comprising identifying a fault condition associated with the grid based on the determined grid dimension.

18. (Original) The method of claim 11, wherein determining the dimension of the grid further comprises determining at least one of a width dimension, a depth dimension, and a sidewall angle dimension.

19. (Currently Amended) A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile; and

comparing the generated reflection profile to a target reflection profile; and

determining a dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile[[.]] and

providing data relating to determining said dimension of said grid.

20. (Original) The method of claim 19, further comprising determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension.

21. (Previously Presented) A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile; and

comparing the generated reflection profile to a target reflection profile;

determining a dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile; and

determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension, wherein determining at least one parameter of the operating recipe of the etch tool comprises determining at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

22. (Original) The method of claim 19, further comprising determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined grid dimension.

23. (Previously Presented) A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile; and

comparing the generated reflection profile to a target reflection profile; and

determining a dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile; and

determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined grid dimension, wherein determining at least one parameter of the operating recipe of the photolithography tool comprises determining at least one of an exposure time parameter, an exposure dose parameter, a depth of focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post exposure bake temperature parameter, a cool plate temperature parameter, a developer temperature parameter, and a focus tilt parameter.

24. (Original) The method of claim 19, wherein generating the reflection profile comprises generating the reflection profile based on at least one of intensity and phase of the reflected light.

25. (Original) The method of claim 19, further comprising identifying a fault condition associated with the grid based on the determined grid dimension.

26. (Original) The method of claim 19, wherein determining the dimension of the grid further comprises determining at least one of a width dimension, a depth dimension, and a sidewall angle dimension.

27. (Original) A metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings, comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to determine a dimension of the grid based on the reflection profile.

28. (Original) The metrology tool of claim 27, wherein the data processing unit is further adapted to compare the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric, select a reference reflection profile closest to the generated reflection profile, and determine the dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile.

29. (Original) The metrology tool of claim 27, wherein the detector is further adapted to generate the reflection profile based on at least one of intensity and phase of the reflected light.

30. (Original) The metrology tool of claim 27, wherein the metrology tool comprises at least one of a scatterometer, an ellipsometer, and a reflectometer.

31. (Original) The metrology tool of claim 27, wherein the data processing unit is further adapted to compare the generated reflection profile to a target reflection profile and determine the dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile.

32. (Original) A processing line, comprising:

a processing tool adapted to process wafers in accordance with an operating recipe;

a metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings, the metrology tool comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to determine a dimension of the grid based on the reflection profile; and

a controller adapted to determine at least one parameter of the operating recipe of the processing tool based on the determined grid dimension.

33. (Original) The processing line of claim 32, wherein the data processing unit is further adapted to compare the generated reflection profile to a library of reference reflection

profiles, each reference reflection profile having an associated grid dimension metric, select a reference reflection profile closest to the generated reflection profile, and determine the dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile.

34. (Original) The processing line of claim 32, wherein the detector is further adapted to generate the reflection profile based on at least one of intensity and phase of the reflected light.

35. (Original) The processing line of claim 32, wherein the metrology tool comprises at least one of a scatterometer, an ellipsometer, and a reflectometer.

36. (Original) The processing line of claim 32, wherein the data processing unit is further adapted to compare the generated reflection profile to a target reflection profile and determine the dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile.

37. (Previously Presented) A processing line, comprising:

a processing tool adapted to process wafers in accordance with an operating recipe;

a metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings, the metrology tool comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to determine a dimension of the grid based on the reflection profile; and

a controller adapted to determine at least one parameter of the operating recipe of the processing tool based on the determined grid dimension, wherein the processing tool further comprises an etch tool, and the controller is further adapted to determine at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

38. (Previously Presented) A processing line, comprising:

a processing tool adapted to process wafers in accordance with an operating recipe;

a metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings, the metrology tool comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to determine a dimension of the grid based on the reflection profile; and

a controller adapted to determine at least one parameter of the operating recipe of the processing tool based on the determined grid dimension, wherein the processing tool further

comprises a photolithography tool, and the controller is further adapted to determine at least one of an exposure time parameter, an exposure dose parameter, a depth of focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post exposure bake temperature parameter, a cool plate temperature parameter, a developer temperature parameter, and a focus tilt parameter.

39. (Original) The processing line of claim 32, wherein the controller is further adapted to identify a fault condition associated with the grid based on the determined grid dimension.

40. (Original) A metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings, comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to compare the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric, select a reference reflection profile closest to the generated reflection profile, and determine a dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile.

41. (Original) A metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings; a plurality of trenches, comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to compare the generated reflection profile to a target reflection profile and determine a dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile.

42. (Currently Amended) A test structure, comprising:

a first plurality of lines; [[and]]

a second plurality of lines intersecting the first plurality of lines, the first and second pluralities of lines defining a grid having openings[[.]]; and

wherein said grid to provide for reflecting light as a result of illuminating at least a portion of the grid such that a reflection profile may be generated using said reflecting light.

43. (Original) The test structure of claim 42, further comprising a process layer, the grid being defined in the process layer.

44. (Original) The test structure of claim 42, wherein the process layer comprises at least one of a photoresist layer, a substrate layer, an insulative layer, and a conductive layer.

45. (Original) A metrology tool, comprising:

means for receiving a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

means for illuminating at least a portion of the grid with a light source;

means for measuring light reflected from the illuminated portion of the grid to generate a reflection profile; and

means for determining a dimension of the grid based on the reflection profile.

46. (Original) The metrology tool of claim 45, further comprising:

means for comparing the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric;

means for selecting a reference reflection profile closest to the generated reflection profile; and

means for determining the dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile.

47. (Original) The metrology tool of claim 45, further comprising:

means for comparing the generated reflection profile to a target reflection profile; and

means for determining the dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile.

Claims 4, 6, 13, 15, 21, and 23 call for determining at least one parameter of an operating recipe based upon the determined grid dimension. Determining a parameter of an operating recipe is indeed a tangible result. For example, the parameter may be used during an operation defined by the operating recipe. The determination of the parameter is clearly a step that is part of a statutory, inventive process. The Examiner had admitted that these claims are useful and concrete. Applicants assert that in addition to being useful and concrete, claims 4, 6, 13, 15, 21, and 23 also provide for a tangible result. Indeed, the determination of a parameter of an operating recipe provides a tangible result that is both useful and concrete. The Examiner has not provided arguments or evidence to the contrary. Therefore, for at least the reasons cited above, claims 4, 6, 13, 15, 21, and 23 are useful, concrete, and provide for a tangible result. Accordingly, claims 4, 6, 13, 15, 21, and 23 call for statutory subject matter and are in compliance with 35 U.S.C. 101. Therefore, claims 4, 6, 13, 15, 21, and 23 are allowable for at least the reasons cited herein.

Independent claims 1, 2, 4, 6, 11, 13, 15, 19, 21, and 23 are allowable for at least the reasons cited 12, 14 and 16-18, which depend from claim 11, claims 20, 22, and 24-26, which depend from claim 19, as also allowable for at least the reasons herein.

The Examiner rejected claims 42-44 under 35 U.S.C. 103(a) as being unpatentable over ***Marinaro***. In light of the amendments and arguments provided herein, Applicants respectfully traverse this rejection.

Applicants respectfully assert that ***Marinaro*** does not teach or make obvious all of the elements of claim 42 (as amended) of the present invention. Claim 42, as amended, calls for first and second pluralities of lines defining a grid having openings, wherein the grid provides for

reflecting light as a result of illuminating at least a portion of the grid, such that a reflection profile may be generated using the reflecting light. ***Marinaro*** does not make obvious this subject matter. The Examiner admits that ***Marinaro*** does not explicitly disclose that the grid pattern has openings. The Examiner argues that since ***Marinaro*** discloses a positive photoresist process, it would be allegedly obvious that the grid patterns would have openings because the regions between the intersecting lines would dissolve away. This argument does not support an assertion of obviousness of the test pattern that comprises the grid pattern openings called for by claim 42 of the present invention.

In fact, the grid that is called for in claim 42 having openings is provided to reflect light as a result of illuminating at least a portion of the grid to generate a reflection profile. The argument that eventually grid patterns would have openings because of the possibility of dissolving away during development does not support Examiner's arguments as to the obviousness of using grids having openings to generate a reflection profile. Applicants respectfully assert that it would be improper application of hindsight reasoning to argue that simply because ***Marinaro*** discloses a positive photoresist process, the grids having openings being used to generate a reflection profile would be obvious. There is insufficient evidence on record as to the contrary. Therefore, the Examiner's argument to assert obviousness of claim 42 using ***Marinaro*** is not persuasive since claims of the present invention explicitly call for grid having openings to provided for reflective light from at least a portion of the grid to generate a reflection profile. This concept is not anticipated or made obvious by the cited prior art.

Further, ***Marinaro*** does not provide disclosure that would make obvious the element of measuring light reflected from the illuminated portion of the grid to generate a reflection profile. ***Marinaro*** merely refers to a digital image of the wafer being created. ***Marinaro*** discloses that

the wafer is oriented to cause diffraction of reflected light, and a digital image of the wafer is created using an optoelectronic scanner. *See* column 5, lines 30-35. ***Marinaro*** does not make obvious a reflection profile, which is a profile of the reflection itself. ***Marinaro*** is merely directed to providing for a digital image of the wafer. Thus, the test pattern comprising the first and second pluralities of openings defining a grid having openings, which may be used for generating a reflection profile is not taught or made obvious by ***Marinaro***. Therefore, claim 42 (as amended) is clearly not taught or made obvious by ***Marinaro***. Accordingly, claim 42 is allowable for at least the reasons cited herein. Further, claims 43-44 depend from independent claim 42, and thus, are allowable for at lest the reasons cited herein.

Applicants acknowledge and appreciate that the Examiner has allowed claims 27-41 and 45-47. However, in light of the discussions provided herein, Applicants respectfully assert that all claims, 1-47, of the present invention, are allowable for at least the reasons cited herein. Reconsideration of the present application is respectfully requested.

In light of the arguments presented above, Applicants respectfully assert that claims 1-47 are allowable. In light of the arguments presented above, a Notice of Allowance is respectfully solicited.

In view of the remarks set forth herein, the application is believed to be in condition for allowance and notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the **Examiner is requested to contact the undersigned attorney at (713) 934-4069** with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,
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